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SINGLE NETWORK TO ELECTRIFY ALL USSR

G. M. Krzhizhanovskiy

The time when a single-power system electrical network will tie together all the diversified power and industrial combines of the USSR can now be foreseen. The USSR is the first country to estimate all the possibilities and the social significance of the EWS (the Single High-Voltage Network).

When the GCELRO Plan was formed, Lenin was especially interested in having each power plant cover as much of the surrounding area as possible. But with the voltage at the time marked at 100,000 volts, the boundaries of the area covered had to be limited to a radius of 150 - 200 kilometers.

The scientist Polivo-Dobrovolskiy foresaw that the world triumph of the three-phase current would be only temporary and that it would be replaced by high-voltage direct current which is cheaper and more efficiently utilized. He foresaw, furthermore, that for the transmission of high power for long distances, the most preferable would be direct current with a voltage of about a million volts, which could easily cover an area of 2,000 - 3,000 kilometers. Only with direct current, he said, would the wide application of underground cables, which are extremely convenient in operation, be possible.

Nevertheless high-voltage alternating current (there is now talk of intensifying this current into 400,000 volts) cannot be easily replaced at present. The progress of the present building of electric machines is bound up with the use of the three-phase alternating current. This current is still highly preferable since it can transform its voltage.

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In the first place, power which can be considered indispensable must be obtained. Wind and water power are the most accessible in the Soviet Union.

The Soviet Union occupies first place in the world in water power resources. The total power of the hydroelectric power plants that can be built would be 300 million kilowatts. This is about 200 times the strength of all the stations of the GOELRO Plan. The Angara-Yenisey system in combination with the gigantic reservoir of Lake Baykal is an extremely important source of water power.

Wind power plants will be pioneers of electrification in those places which are distant from electric power plants and electric networks. But wind has the great defect of being unsteady. Soviet wind power plants are being perfected, but nevertheless the necessity of constancy in the operation of a power plant cannot be underestimated. From this point of view, wind power plants will always need some assured reserve. The best reserve insurance would be the inclusion of a wind power plant as a part of big electrical networks. EVS thus would become the best accumulator and rationalizer of wind power.

What will this single high-voltage network be?

It will stretch across all of the Siberian expanse and will include two huge electrical circuits: one in Western and one in Eastern Siberia. Electrified railroad trunk lines now join the Urals with the Caucasus and the Donbass, and Moscow with Leningrad and Murmansk. Before the completion of this gigantic project we will have 10,000 kilometers of electrified railroad trunk lines. It is clear that the building of huge electric trunk lines and parallel electrified railroads is one of the most important tasks in the building of EVS in the future.

On the other hand, in European USSR, half the Volga trunk line with huge hydroelectric power plants along the river's whole length might easily be included in a single line from the western side, relying on the coal resources of the Donbass and on the peat resources of White Russia. Such a circular network system is the most reliable for regular and economically advantageous supply of power to the vast surrounding regions.

This fundamental framework of our future EVS will depend in a large degree on the type of basic electric power plants planned for the future.

Concerning the future thermoelectric power plants, there is already a plan to use steam of higher pressure and temperature in them. The power of the separate boilers is already beginning to surpass the production of 200 tons of steam per hour, so that two such boilers guarantee the work of a turbine using 100,000 kilowatts of power. Steam pressure is now limited to 100 atmospheres. At present, not only water but also other chemical matter takes on the role of heat-carrier, and some of these allow the development of a very high temperature with a relatively low pressure. The future thermoelectric power plants will far exceed the present-day electric power plants in power output.

Power plants, rather than merely burning fuel, will utilize the valuable constituents of coal and the burning of waste products by the addition of new equipment. This additional processing of waste products will furnish chemical raw materials and a significant amount of gas.

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The cables of the high-voltage direct current electric power plants to distribute power over thousands of kilometers. Consequently, the area from the Atlantic Ocean might be covered by five or six power plants, while for the entire USSR, in the fundamental, 20 - 30 electric power plants should be enough to supply power to the entire country.

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